out in a review of the early life and struggles of Faraday how difficult it was then to obtain the least help in study compared with the accessible advantages that are so widely distributed over the country to-day. The students accordingly should fully appreciate their opportunities and use them to the best advantage, not merely as a means for the acquisition of knowledge, valuable and important as this is, and, above all, not as something which may lead to material advancement, but as a means of training the powers possessed by each so as to develop them for action beneficial both to themselves and to their fellows. A hundred years ago men like Faraday, Watt, and Arkwright worked at a time when the world was comparatively young in knowledge; they had a clean slate to write upon. But while the difficulties of their pioneer work were enormous, and they started from a position of comparative ignorance of scientific principles, and simple in character as their respective discoveries were, the applications which have followed from them have led to a high general level of scientific knowledge to-day which has become the starting point for modern conditions of study. Accordingly, if the country is to profit by the modern progress of science, the mass of the people must be educated up to this higher plane of knowledge, for it is by intelligent action and patient effort and devotion on the part of the rank and file of workers that general advances come. The work of the Sir John Cass Institute and of similar schools throughout London is exerting a most important influence in securing this higher level of knowledge for those engaged in work associated with the industries of the country.

SOCIETIES AND ACADEMIES.

London.

Royal Society, June 20.—"On the presence of Sulphur in some of the Hotter Stars." By Sir Norman **Lockyer**, K.C.B., F.R.S.

In this paper the author gives an account of the discovery of the strongest spark lines of sulphur in the spectrum of Rigel. These lines had not previously been traced in any celestial spectrum. It is also shown that two strong sulphur lines (4253·8, 4285·1), which are of abnormal behaviour in the spark and vacuum-tube spectra, are lacking in the Rigel spectrum. They have been found to occur, however, in the Crucian (Bellatrix) and Alnitamian (ε Orionis) types of stellar spectra, which represent higher stages of temperature than the Rigelian type. In the two types mentioned the Rigel-sulphur lines are either lacking or very weak.

Concisely, the following represents the relative and inverse behaviour of the two sets of lines in stellar spectra:—

Group	Type Star	Sharp Lines (4253·8, 4285·1)	Diffuse lines
Alnitamian	ε Orionis	Well shown	Absent
Crucian ...	γ Orionis	Present, but weaker than in ε Orionis	Strongest lines present, but weaker than in β Orionis
Rigelian ...	β Orionis	Absent	Well shown

November 7.—"Note on the Association of Helium and Thorium in Minerals." By the Hon. R. J. **Strutt**, F.R.S.

The question has been often raised of whether or not helium is a product of thorium radio-activity. The author's view throughout has been that it is (Roy. Soc. Proc., vol. lxxiii., p. 191, 1904, also March 2, 1905). Mr. Boltwood has recently argued that the helium in radio-active minerals may always be attributed to the action of the uranium-radium series of transformations (*Am. Journ. Sci.*, vol. xxiii., February, p. 77). In the present note the author directs attention to a case where that view is clearly untenable.

Prof. Julius Thomsen, of Copenhagen, described, in 1898 (*Zeit. physikalische Chemie*, vol. xxv., part iii.), a helium mineral from Ivitgut, Greenland, similar in some respects to fluor-spar, but containing rare earths. Recently he has determined the quantity of helium liberated on heating as 27 c.c. per kilogram (*Bull. de l'Acad. Royale des Sciences*, Copenhagen, 1904, 53–57).

Prof. Thomsen kindly sent a supply of this mineral to the author, who has carefully tested it for radium, and finds that it contains no more than the traces which are ubiquitous in rocks and minerals. The quantity found was, in fact, about the same as in average rocks, and is insufficient to account for one-hundredth part of the helium present.

On the other hand, a solution of the mineral gave abundant thorium emanation. The author is inclined to think that there is some unknown complication about the thorium-emanating power of solutions which makes it unsafe, in certain cases at least, to infer from it the quantity of thorium present; but enough thorium emanation was given off by the solution to show that thorium was a substantial constituent of the mineral. He regards it as entirely certain that the helium in this mineral has not been generated *in situ* by uranium or radium, and has no hesitation in connecting it with the presence of thorium.

"On the Measurement of Temperatures in the Cylinder of a Gas Engine." by Prof. **Callendar**, F.R.S., and Prof. W. E. **Dalby**.

It is important in the experimental investigation of the internal-combustion engine to be able to measure the temperature at a suitable point in the cycle.

The difficulty of making this direct measurement arises from the fact that during the cycle of operations in the working cylinder the temperature rises above the melting point of platinum or of any thermoelectric couple which can be used for the observation. Also, since the temperature is changing so rapidly, whatever apparatus is used to measure the temperature must have small mass; moreover, its insertion in the cylinder of the engine must not alter the volume or disposition of the clearance space, otherwise there will be danger of pre-ignition.

The authors use a platinum wire 0·01 inch diameter and 1 inch long in conjunction with a compensator of the same diameter and ⅜-inch long, and the temperature is measured by measuring the change of resistance corresponding to the middle ⅝-inch of the 1-inch wire. To avoid the difficulty experienced by previous experimenters in this direction, the platinum thermometer is screened from the high temperature by placing it in a valve which allows the thermometer to be exposed during any part of the cycle for a suitable interval of time, and to be perfectly protected from the high temperature when the valve is closed. This valve is contrived in the spindle of the admission valve, and the gear for operating it is clearly shown in the figures in the paper. The advantage of this position is that as the whole charge of air and gas streams into the cylinder around the spindle of the admission valve the temperature of the valve and the thermometer inserted in it are brought continually into approximation during the whole of the suction stroke, so that at the instant when the contact is made for the measurement of the temperature, namely, just after the close of the admission valve, the thermometer and the temperature it is required to measure do not differ widely in temperature; moreover, at this point in the cycle the rate of change of the temperature is nearly a minimum. In measurements of this kind it is essential that there should be no missed explosions, and the authors therefore arranged the engine so that this condition should be exactly fulfilled during the whole of the experiments.

Experiments were made to determine the lag of the platinum thermometer behind the temperature of the fluid it purported to measure, and to determine the effect of the valve carrying the thermometer on the temperature indicated by the thermometer. The conclusion arrived at by the authors is that the method may be used to give the temperature of the charge at the beginning of compression within 1° C.

A few experiments were quoted in the paper, from which it appears that at full load the temperature rises to a point between 2000° C. and 2500° C. when the mixture is rich.

Geological Society, November 6.—Sir Archibald Geikie, K.C.B., Sec.R.S., president, in the chair.—A collection of fossil plants from South Africa; Prof. A. C. **Seward**. The material on which this paper is based was, for the most part, collected by members of the Geological Survey in Cape Colony from the Molteno and Burghersdorp beds. The Molteno beds are placed at the base of the Upper Karroo, or Stormberg series; the Burghersdorp beds constitute the uppermost strata of the Middle Karroo, or Beaufort series. Mr. A. L. Du Toit, who has contributed accounts of the stratigraphy of the plant-bearing and associated rocks, describes the occurrence of a transitional zone between the Molteno and the Burghersdorp beds. A description is also given of *Schizoneura africana*, Feistmantel, a species originally figured by Hooker in an appendix to Bain's paper, published in 1845. The additional plants recorded from the Molteno beds afford further evidence in favour of assigning this member of the Stormberg series to the Rhætic period. While possessing certain Rhætic species, the Burghersdorp flora as a whole indicates a somewhat lower horizon.—Permo-Carboniferous plants from Vereeniging (South Africa): Prof. A. C. **Seward** and T. N. **Leslie.** The majority of the specimens described in this paper were obtained by Mr. Leslie from a sandstone quarry $1\frac{1}{2}$ miles from Vereeniging, on the banks of the Klip River; the sandstones are associated with shales, coal-seams, and glacial conglomerates. In the opinion of the authors, the plant beds should be included in the Ecca series (Lower Karroo). While recognising certain well-marked differences between the Glossopteris floras and the Upper Carboniferous and Permian floras of the northern hemisphere, they are inclined to think that there are more types common to the two botanical provinces than is generally supposed.—The structure and relations of the Laurentian system of Canada: Prof. F. D. **Adams.** This paper contains an outline of the results of the examination by Dr. Barlow and the author of an area of 4200 square miles, comprised within the Haliburton and Bancroft sheets of the Ontario and Quebec series of maps. The main conclusions reached by the author may be thus summarised:—(1) The Laurentian system of Sir William Logan consists of a very ancient series of sedimentary strata, largely limestones, invaded by great volumes of granite in the form of bathyliths. (2) This sedimentary series is one of the most important developments of the pre-Cambrian rocks in North America, it presents the greatest body of pre-Cambrian limestones on the continent, and it is best designated as the Grenville series. (3) The invading masses of granite are of enormous extent; they possess a more or less distinct gneissose structure, due to the movements of the magma, which developed a fluidal and, in the later stages of intrusion, a protoclastic structure in the rock. (4) The granite gneiss of the bathyliths not only arched up the invaded strata into a series of domes, but "stoped" out portions of the sides and lower surface of the arches, the fragments torn off from walls and roof by the invading granite being found scattered throughout the mass of the invading rock; this "stoping," however, probably developed only a small part of the space which the granite now occupies. (5) The invading granite not only exerted a mechanical action upon the invaded strata, but also gave rise to a variety of metamorphic products, among others amphibolite, produced by its action in the limestone, which accounts for the fact that while the invaded strata are chiefly limestone, the fragments of the latter, where found in the granite, consist of amphibolite. (6) The invading bathyliths and allied intrusions of granite occupy the greater part of the great northern protaxis of Canada, which has an area of approximately 2,000,000 square miles. It has, therefore, been considered advisable to restrict the name Laurentian to this great development of the "fundamental gneiss," which, although intrusive into the Grenville series, nevertheless underlies and supports it. (7) The relation of the Grenville series, which forms the base of the sedimentary portion of the geological column in eastern Canada, to the Huronian and Keewatin series, which are the oldest stratified rocks in the western part of the protaxis, has yet to be determined, the two not having so far been found in contact; nowhere, moreover, either east or west, has the original basement on which the first sediments were laid down been discovered; these are everywhere torn to pieces by the granite intrusions of the Laurentian.

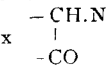
Linnean Society, November 7.—Prof. W. A. Herdman, F.R.S., president, in the chair.—The origin of the dimerous floral whorls of certain dicotyledons: Rev. G. **Henslow.** The object of the present paper was to show that the ternary arrangements of monocotyledons are not derived from the same source as those of certain dicotyledons, every verticil of three members in the former being a *single cycle* of the $\frac{1}{3}$ divergence, while in the latter the usually *double* verticils are derived from the $\frac{2}{5}$. This divergence is unknown in the foliage of monocotyledons, $\frac{1}{2}$ or $\frac{1}{3}$ being the natural sequence from a single cotyledon, whereas $\frac{2}{5}$ necessarily follows on the two cotyledons or from opposite and decussate leaves.—Eight very remarkable new species of Acari from New Zealand, from the collection of the late E. Bostock, six Oribatidæ and two Gamasidæ: A. D. **Michael.** The species are to be called *Oribata bostocki*, distinguished by the pteromorphæ being attached to the anterior margin of the abdomen instead of its lateral margin; *Notaspis spinulosa*, carrying spinulated hairs of extraordinary size; *Notaspis caudata*, with a posterior projection not hitherto found in the genus; *Hermannia phyllophora*, with great leaf-like processes on the legs; *Nothrus cophinarius* and *N. unguifera*, extreme exaggerations of that section of the genus represented in Europe by *N. spiniger*; *Trachynotus sclerophyllus*, in which the great leaf-like transparent hairs found on many Acari have become opaque, hard, brown chitin; and *T. fimbriatus*, with singular flattened borders to the first pair of legs, much broader than the legs themselves.—*Ænigmatistes africanus*, a new genus and species of Diptera: R. **Shelford.**

November 21.—Prof. W. A. Herdman, F.R.S., president, in the chair.—*Exhibits.*—C. W. **Anderson**: A specimen of a light-giving larva brought by him from near the boundary of British Guiana with Brazil, exhibiting when living a ruby light in its head, and a double row of phosphorescent spots along the body, two on each segment. These lights were not intermittent, but glowed continuously. This presumed coleopterous larva was called "Macadoub" by the natives, and is not uncommon in the region named.—Prof. **Dendy**: Two living specimens of Peripatus from the Cape, which he had succeeded in keeping in excellent health by supplying them with woodlice as food.—*Papers.*—Abnormal structures in leaves and their value in morphology: W. C. **Worsdell.** *Dichotomy*, as in crested fern leaves, is a reversion to a primitive type of frond-branching. In cotyledons it represents a tendency, which in this case is progressive and not reversionary, to increase the number of cotyledons. *Phyllotaxis:* Dichotomy of foliage leaves is, in the author's opinion, a reversion from the opposite, or distichous, arrangement to form a greater number of leaves on the axis; it is probably a step towards the original spiral arrangement. *Spiral torsion* is due to a reversion from the opposite or whorled arrangement of leaves to the spiral arrangement. *Terminal leaves:* This is regarded as a reversion to the primeval structure in which, according to the phyton theory, each leaf terminates each segment of the stem above which it is situated, every leaf being thus essentially a terminal organ and not lateral. *Enations and ascidia:* The foliage leaves of *Saxifraga ligulata* show formation of basal pockets on upper side of leaf and transformation of entire leaf into a cup-shaped structure; also infolding of basal lobes, which infolding may extend right up midrib to apex. This infolding may also occur for a short distance from the apex downwards. A similar structure may be represented merely by slight enations on either side of the midrib. Lobing may occur at the apex; small lobes may become abstricted off as stalked structures, which may either be terminal or carried over on to the dorsal (lower surface) of the leaf in form of small, stalked ascidia. *Virescence:* The various foliar organs of the flower may revert to the condition of foliage leaves, *e.g.* phyllody of the calyx in the rose, phyllody of carpels in Trifolium. *Monocotyledonous seedlings in dicotyledons:* Normal cases of this occur, as in *Ranunculus Ficaria*, L.; here the conditions are regarded as primitive. Abnormal cases occur in which the two cotyledons arise congenitally fused into a single one, as in Umbelliferæ. This is a reversion to the primitive condition.—Two new species of

Amphipoda: Rev. T. R. R. **Stebbing.** The species were described as *Lepechinella chrysotheras*, representing a new genus in the family Paramphithoidæ, and *Rhachotropis palporum* in the family Eusiridæ.—The preservation of specimens in Australian museums: J. G. Otto **Tepper.** The author pointed out that the life-cycle of *Anthrenus musaeorum* involved visits to flowers, and that the presence of their destructive larvæ in museum collections was due to the eggs being laid in proximity to the cases, and the active and minute larvæ subsequently finding their way into the containing cases by cracks or similar apertures.

Mineralogical Society, November 12.—Prof. H. A. Miers, F.R.S., president, in the chair.—Hopeite and other zinc phosphates and associated minerals from Broken Hill mines, north-western Rhodesia: L. J. **Spencer** (see NATURE, vol. lxxvi., p. 215). Hopeite is abundant as brilliant water-clear crystals or as larger white crystals reaching 2 cm. across. The crystals are orthorhombic, with $a:b:c=0{\cdot}5786:1:0{\cdot}4758$. Cleavage flakes parallel to the brachypinacoid show a zonal intergrowth of two substances, distinguished as α-hopeite and β-hopeite; these differ considerably in their optical characters, and slightly in sp. gr. (3·0–3·1) and the temperature at which water is expelled. Associated with the hopeite crystals on the bone-breccia are brown botryoidal masses of vanadinite. The other zinc phosphates occur, not in the bone cave, but with cellular limonite and crystals of descloizite and pyromorphite in connection with the zinc-lead ores (which consist of an intimate mixture of cerussite and hemimorphite with interspersed limonite). The new species, *tarbuttite*, occurs in great abundance, and is a basic zinc phosphate, $Zn_3P_2O_8.Zn(OH)_2$, with sp. gr. 4·15; the crystals are anorthic with $ac=55^\circ\ 50'$, $ab=84^\circ\ 34'$, $bc=76^\circ\ 31'$, c being a direction of perfect cleavage. Pseudomorphs of tarbuttite after calamine ($ZnCO_3$), descloizite, and hemimorphite are not uncommon. Another new species, named *parahopeite*, has the same chemical composition as hopeite, $Zn_3P_2O_8.4H_2O$, but is anorthic, with sp. gr. 3·31. The platy crystals somewhat resemble hemimorphite in appearance; they have one perfect cleavage, approximately perpendicular to the plates, through which emerges one of the optic axes.—The question of a relation between isomorphous miscibility and parallel growths: T. V. **Barker.** A study of the growths on each other of immiscible or slightly miscible pairs of substances has shown that, although miscibility and parallel growths are favoured by the same factor—similarity of molecular volume—yet the two properties do not always go hand in hand, for many immiscible or only slightly miscible substances form parallel growths quite readily. Mixed crystals, therefore, should not be regarded as built up of alternating parallel layers.—Notes on zeolites from Cornwall and Devon: A. **Russell.** The occurrence of zeolites in various localities was described, *e.g.* that of heulandite near Okehampton, stilbite at Botallack and St. Ives, chabazite at Luxullian, apophyllite and analcite at Lostwithiel.—Note on the crystallisation of potassium bichromate: Prof. H. A. **Miers.** Two stages of growth of potassium bichromate crystallising from a drop of solution were described and illustrated by lantern-slides.—Various minerals from the Lengenbach quarry and the Ofenhorn, Binnenthal: R. H. **Solly.** Crystals of binnite, one of them a unique twin, and examples of the regular intergrowth of sartorite and baumhauerite, were described, and the occurrence of brookite and molybdenite on the Ofenhorn was for the first time recorded.—Mr. L. J. Spencer exhibited on behalf of Dr. H. J. **Johnston-Lavis** some minute crystals of hæmatite found in association with chlormanganokalite in blocks ejected from Vesuvius during the eruption of 1906. The crystals have the form of acute scalenohedra $\beta\{31\bar{3}\}=\{24\bar{6}1\}$.—A fine series of zeolites from the neighbourhood of Belfast was shown by Mr. F. N. A. **Fleischmann**; a new meteoric stone from Simondium, Cape Colony, by Dr. G. T. **Prior**; specimens of reconstructed ruby and blue spinel, and of the new gem, benitoite, by Dr. G. F. Herbert **Smith**; and a specimen of artificial hæmatite by Mr. C. J. **Woodward.**

Royal Anthropological Institute, November 19.—Mr. F. W. Rudler, past-president, in the chair.—Excavation of a barrow at Chapel Carn Brea, Cornwall: H. C. **King** and B. C. **Polkinghorne.** The barrow was opened in August, and was found to contain a cist built of flat-faced irregular stones with capstone. A very fine large urn, ornamented with the characteristic pattern, was found, containing partly calcined bones. Flint flakes were found, but these were of earlier date than the urn, and were probably placed in the kist from traditional motives. The barrow may have been surrounded by standing stones, as one is still in position. Above the cist at the north end another somewhat smaller urn was discovered.—Holed stone at Kerrow, St. Just in Penwith, Cornwall: H. C. **King** and B. C. **Polkinghorne.** This consists of a circular slab of granite with a cylindrical hole in the centre, very well worked, apparently by iron tools. Wood charcoal was discovered underneath. Its purpose is unknown.—Small cist and urn at Tregiffian Vean, St. Just in Penwith: H. C. **King** and B. C. **Polkinghorne.** The cist is a small one with a broken capstone. The urn, which is also small, dates about 400 B.C. No bones or ashes were found.—The wild tribes of the Ulu Plus, Malay Peninsula: F. W. **Knocker.** The tribes dealt with occupy the upper waters of the Plus River in Perak. They are apparently of mixed Semang-Sakai characteristics. The paper dealt with their habits of life, manners, and customs.

Chemical Society, November 21.—Sir William Ramsay, K.C.B., F.R.S., president, in the chair.—Emulsions: S. **Pickering.** Paraffin oil, when churned with solutions of soap, glue, starch, albumen, &c., forms an emulsion, which rises, like cream, to the surface of the excess of water, and contains from 65 per cent. to 82 per cent. by volume of oil. The percentage of oil can be increased to 99 per cent., the emulsion then being practically solid. Emulsification seems to depend on the separation from the liquid of very minute solid particles, which are attracted by and surround the oil globules, thus preventing them from coalescing. Any precipitated substance which is sufficiently finely divided will act as an emulsifying agent, but, after becoming agglomerated by drying, it loses this property.—Aromatic azoimides, part iii., the naphthylazoimides and their nitro-derivatives: M. O. **Forster** and H. E. **Fierz.**—The triazo-group, part i., triazoacetic acid and triazoacetone (acetonylazoimide): M. O. **Forster** and H. E. **Fierz.** The interesting properties displayed by the triazo-group when occurring in the complex  $\begin{array}{l}-\mathrm{CH.N_3}\\ \ \ |\\ -\mathrm{CO}\end{array}$ have led the authors to prepare the simplest typical compounds of this class, triazoacetic acid and triazoacetone.—Studies of dynamic isomerism, part vii., note on the action of carbonyl chloride as an agent for arresting isomeric change: T. M. **Lowry** and E. H. **Magson.** Labile solutions of nitrocamphor, in which isomeric change has been suspended, have been prepared (1) accidentally by dissolving nitrocamphor in choloroform, and (2) deliberately by adding acid to the solvent chloroform. In the latter case the solutions acquired a powerful odour of carbonyl chloride, and there can be no doubt that this is the efficient agent in arresting isomeric change in chloroform solutions. By means of this new agent it is possible to arrest the isomeric change of nitrocamphor in other solvents.—The electrometric determination of the hydrolysis of salts: H. G. **Denham.**—The interaction of metallic sulphates and caustic alkalis: S. **Pickering.** Alkalis, added to solutions of various metallic sulphates, precipitate a definite basic sulphate, except in the case of manganese and magnesium, where the hydroxide is precipitated. The further addition of alkali converts the basic sulphate either into another, sometimes consecutively into two other, more basic products (for example, copper and nickel), or into the hydroxide.—The chemistry of Bordeaux mixture: S. **Pickering.** The substances formed on the addition of lime to copper sulphate, as in the preparation of Bordeaux mixture, are dependent on the proportions of lime used, and may be either

(1) $4CuO,SO_3,0{\cdot}06CaSO_4$;
(2) $5CuO,SO_3,0{\cdot}25CaSO_4$;
(3) $10CuO,SO_3,1{\cdot}3CaSO_4$;
(4) $10CuO,SO_3,4CaO,SO_3$;
(Possibly 5) $10CuO,SO_3,10CaO,SO_3$; or
(6) $CuO,3CaO$;

that present in most cases probably being (4). The fungicidal action of Bordeaux mixture seems to depend on the liberation of copper sulphate by the action of carbon dioxide on the basic sulphate.—The alcohols of the hydroaromatic and terpene series, part i., resolution of the alcohols into their optically active components and the preparation of the borneols: R. H. **Pickard** and W. O. **Littlebury.** The alcohol is combined with phthalic or succinic anhydride, and the resulting acid ester resolved by *l*-menthylamine or other strong optically active base.—The electrolytic preparation of disulphides, part i., dibenzyldisulphide and diethyldisulphide: T. S. **Price** and D. F. **Twiss.**—The influence of solvents on the rotation of optically active compounds, part xi., ethyl tartrate in aliphatic halogen derivatives: T. S. **Patterson** and D. **Thomson.**—The interaction in solution of ferrous sulphate and copper sulphate: H. R. **Ellis** and W. H. **Collier.** No action takes place between ferrous sulphate and copper sulphate solutions in the cold, but on boiling, the copper sulphate slowly oxidises the ferrous hydroxide produced by hydrolysis. An account is also given of the action of ammonia solution on mixtures of ferrous and cupric sulphates in water.—Mercurous hyponitrite: E. **Divers.**—Decomposition of mercurous and silver hyponitrites by heat: E. **Divers.**—Cupric nitrite: E. **Divers.**

DIARY OF SOCIETIES.

THURSDAY, DECEMBER 12.

ROYAL SOCIETY, at 4.30.—Further Consideration of the Stability of the Pear-Shaped Figure of Equilibrium of a Liquid Earth: Sir G. H. Darwin, K.C.B., F.R.S.—Preliminary Note on the Operational Invariants of a Binary Quantic: Major P. MacMahon, F.R.S.—The Action of Ozone on Water-colour Pigments: Sir W. Abney, K.C.B., F.R.S.—On Kinetic Stability: Prof. H. Lamb, F.R.S.—The Absorption Spectra of the Vapours of Benzene and its Homologues at Different Temperatures and Pressures, and likewise of Solutions of Benzene: Prof. W. N. Hartley, F.R.S.—The Spectrum of Magnesium and of the so-called Magnesium Hydride as obtained by Spark Discharges under Reduced Pressure: E. E. Brooks.—Magnetic Declination at Kew Observatory, 1890 to 1900: Dr. C. Chree, F.R.S.—The Effects of Temperature and Pressure on the Thermal Conductivities of Solids. Part ii., The Effect of Low Temperatures on the Thermal Conductivities of Pure Metals and Alloys: Prof. C. H. Lees, F.R.S.—On Exterior Ballistics, No. 2: Prof. G. Forbes, F.R.S.

SOCIETY OF ARTS, at 4.30.—Big Game in India: R. Gilbert.

MATHEMATICAL SOCIETY, at 5.30—A Formula in Finite Differences and its Application to Mechanical Quadrature: Mr. S. T. Shovelton.—Weierstrass' Excess-function in the Calculus of Variations: Prof. A. E. H. Love.

FRIDAY, DECEMBER 13.

MALACOLOGICAL SOCIETY, at 8.—Additions to the Marine Molluscan Fauna of New Zealand, with Descriptions of New Species: H. Suter.—Alteration to the name of *Mitra recurva*, Sow. (preoccupied): G. B. Sowerby.—Descriptions of New Species of Fresh-water Shells from Central Africa: C. A. Smith.—New Land and Marine Shells from West Africa: H. B. Preston.

SOCIETY OF ARTS, at 8.—Industrial Poisons—Lead and Phosphorus—with Special Reference to the Manufacture of Lucifer Matches: Prof. T. Oliver.

PHYSICAL SOCIETY, at 7–10.—Exhibition of Electrical, Optical, and other Physical Apparatus.

ROYAL ASTRONOMICAL SOCIETY, at 5.—Observations of the Transit of Mercury, November 14, 1907: E. T. Whitelow.—Solar Parallax Papers, No. 6, Construction of a Standard Catalogue of Photographic Star-places: A. R. Hinks.—Observation du Passage de Mercure sur le Soleil, le 14 Novembre, 1907; R. Jonckheere.—Observations of Saturn's Ring at the Time of its Disappearance in 1907, made with the 40-inch Reflector of the Yerkes Observatory: E. E. Barnard.—On the Lunar Inequalities due to Planetary Action: Ernest W. Brown.—The Transit of Mercury, 1907 November 14: R. T. A. Innes.—Occultations of Uranus by the Moon in 1908, Visible at British Observatories: A. M. W. Downing.—On Ancient Eclipses: P. H. Cowell.—On the Mean Distances of the Groombridge Stars: A. S. Eddington.—*Probable Paper*: Note on the Single Equations which comprises the Theory of the Fundamental Astronomical Instruments: Sir R.S. Ball.

SATURDAY, DECEMBER 14.

ESSEX FIELD CLUB (at Essex Museum of Natural History, Stratford), at 6.—Discussion on Rivers Pollution from the Naturalists' Point of View: Opened by Prof. R. Meldola, F.R.S.

MONDAY, DECEMBER 16.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—In Search of an Arctic Continent: A. H. Harrison.

SOCIETY OF ARTS, at 8.—The Theory of the Microscope: Conrad Beck.

SOCIOLOGICAL SOCIETY, at 8.—The Tutelage of Races: J. M. Robertson, M.P.

INSTITUTE OF ACTUARIES, at 5.—On the Method of Dr. Johannes Karup of Valuing in Groups Endowment Assurances, and Policies for the Whole of Life by Premiums Limited in Number: G. King.—Bonus Reserve Valuations: C. R. V. Coutts.

TUESDAY, DECEMBER 17.

SOCIETY OF ARTS, at 8.—How to Make the Most of a Museum: Lewis F. Day.

ROYAL ANTHROPOLOGICAL INSTITUTE, at 8.15.—A Japanese Book of Divination: W. G. Aston, C.M.G.

ROYAL STATISTICAL SOCIETY, at 5.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Keyham Dockyard Extension: Sir Whately Eliot.—Keyham Dockyard Extension; Temporary Works, and Plant and Appliances used in Construction: G. H. Scott.

FARADAY SOCIETY, at 8.—A Physico-chemical Study of the Complex Copper-Glycocoll Sulphates: T. Barker.—The Centenary of the Discovery of the Alkali Metals by Davy; the Industrial Developments of the Discovery: Dr. F. Mollwo Perkin.

WEDNESDAY, DECEMBER 18.

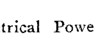
ROYAL METEOROLOGICAL SOCIETY, at 7.30.—The Possibility of a Topography of the Air based on Balloon Observations with Special Theodolites: Captain C. H. Ley.—Indications of Approaching Frost: R. Strachan.

GEOLOGICAL SOCIETY, at 8.—Some Recent Discoveries of Palæolithic Implements: Sir John Evans, K.C.B., F.R.S.—On a Deep Channel of Drift at Hitchin (Hertfordshire): W. Hill.

BRITISH ASTRONOMICAL ASSOCIATION, at 5.

ROYAL MICROSCOPICAL SOCIETY, at 8.—Some African Rotifers: Jas. Murray.—Gregory and Wright's Microscope; and a Correction for a Spectroscope: E. M. Nelson.—Exhibition of Selenite Specimens showing Interesting Features due to Twinning: E. Large.

THURSDAY, DECEMBER 19.

CHEMICAL SOCIETY, at 8.30.—Derivatives of Tetramethyl Glucose: J. C. Irvine and A. M. Moodie.—The Characterisation of Mercerised Cotton; Preliminary Note: J. Hübner.—Attempted Synthesis of  $\begin{array}{c}\beta{-}N{-}{-}\beta\\ |\\ \beta{-}CH{-}\beta\end{array}$ Dinaphthacridine; Condensation of Methylene Dichloride and 1-Substituted-2-Naphthylamines: A. Senier and P. C. Austin.

LINNEAN SOCIETY, at 8.

INSTITUTION OF MINING AND METALLURGY, at 8.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Electrical Power in Railway Goods Warehouses: H. Henderson.

FRIDAY, DECEMBER 20.

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